

*X*  
*sub/s*  
16. A method for depositing wear-resistant coatings on metal surfaces of machine components and articles, said method comprising the following steps:

- (i) providing an ion-plasma deposition chamber;
- (ii) locating said machine components or articles being treated inside said ion-plasma deposition chamber as an anode;
- (iii) locating in said chamber cathodes made from the Group IVA - VIA metals and/or alloys thereof;
- (iv) establishing in said chamber a gas atmosphere wherein the gas is selected from the group consisting of inert or non-inert gases and mixtures thereof;
- (v) effecting, whenever necessary, ion cleaning of surfaces of machine components or articles;
- (vi) effecting selective ion-plasma deposition of microlayers of a coating, wherein at least one microlayer (a) consists of said metals, mixtures thereof or substitution alloys, a second microlayer (b) consists of solutions of nonmetallic atoms of nitrogen, carbon, and boron in said metals, and a third microlayer (c) consists of chemical compounds of said metals with nonmetals in the form of nitrides, carbides, borides and mixtures thereof;
- (vii) subjecting one or more of said microlayers to treatment by implanting thereinto high energy non-metallic ions;
- (viii) cooling and unloading said machine components or articles from said chamber.

17. A method as defined in claim 16, CHARACTERIZED in that after having been cooled and unloaded said machine components or articles are subjected to vibromechanical treatment with micro-pellets.

*App'd*  
18. A method as defined in claim 16, wherein said machine components or articles are made from titanium, titanium alloys, steels or nickel-based alloys.

~~Sub 1~~  
~~Sub 2~~  
19. A method as defined in claim 16, wherein said cathodes are selected from titanium alloys, steels or nickel-based alloys which after having been cooled form a composition similar to the base material of a machine component or article.

20. A method as defined in claim 16, wherein said plurality of microlayers is selected from the numbers 3-500, and said microlayers (a), (b), (c) alternate successively.

21. A method as defined in claim 19, wherein the thickness values of said microlayers (a), (b), (c) are in a ratio of 1.0:2.0:2.5.

22. A method as defined in claim 16, comprising preliminary deposition of a microlayer consisting of scandium, yttrium or other rare earth metal having a thickness of 0.02 to 0.08 micron before step (vi).

23. A method as defined in claim 16, wherein the reaction gas is nitrogen, acetylene, methane or diborane.

24. A method as defined in claim 16, wherein ion deposition is effected with ions of argon, or nitrogen, or carbon, or boron at an accelerating voltage of 10-50 kV, at a radiation dose of  $10^{14} - 10^{18}$  ion/sq.cm and an energy of ions of  $5 \times 10^3 - 1 \times 10^5$  eV.

25. A method as defined in claim 16, wherein said ion-plasma deposition step (vi) comprises the steps of depositing:

- (a) a scandium microlayer in argon atmosphere;
- (b) a titanium microlayer in argon atmosphere;

*Cont'd*

(c) a microlayer comprising a solid solution of implanted nitrogen ions in titanium in an atmosphere comprising a mixture of nitrogen and argon;

(d) a microlayer comprising titanium nitride implanted with nitrogen ions in nitrogen atmosphere.

(e) a zirconium microlayer in argon atmosphere;

*2*  
*Cont'd*

(f) a microlayer comprising a solid solution of implanted nitrogen ions in zirconium in an atmosphere comprising a mixture of nitrogen and argon;

(g) a microlayer comprising zirconium nitride implanted with nitrogen ions in nitrogen atmosphere; and

(h) the step of repeating said steps (b-g) to provide the required plurality of microlayers.

26. A method as defined in claim 16, wherein said deposition step (vi) comprises depositing:

(a) a first microlayer comprising alloys of titanium and zirconium in an inert gas atmosphere;

(b) a microlayer comprising alloys of titanium and zirconium implanted with nitrogen ions in an atmosphere of a mixture of said inert gas and nitrogen;

(c) a microlayer comprising titanium and zirconium nitrides implanted with nitrogen ions in nitrogen atmosphere;

(d) repeating said steps (a) - (c) to provide the required plurality of microlayers;

(e) ion deposition with argon ions of the deposited multilayer coating.

27. A method as defined in claim 26, wherein said deposition step (vi) comprising depositing:

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